CLAIMS:

1. A method of determination of a property of an optical device under test, comprising the steps of:

- splitting an incoming light beam into a first light beam and a second light beam,

- coupling the first light beam into the optical device under test,

- letting the second light beam travel a different path as the first light beam,

- splitting the second light beam into a first part and a second part,

- delaying the second part of the second light beam relative to the first part of the second light beam,

- recombining the first and the second part of the second light beam,

- superimposing the first light beam and the recombined parts of the second light beam to produce interferences between the first light beam and the recombined parts of the second light beam in at least one resulting superimposed light beam,

- detecting the power of the at least one superimposed light beam as a function of frequency and polarization when tuning the frequency of the incoming light beam over a given frequency range,

- deriving the optical property of the optical device under test from the frequency dependence of the detected powers.

2. The method of claim 1, further comprising the step of:

- deriving elements of the Jones matrix for the optical device under test from the frequency dependence of the detected powers.

3. The method of claims 1 or 2, further comprising the steps of:

- changing the polarization of the first light beam with respect to a

original polarization of the first light beam into a changed polarization, preferably said changed polarization being orthogonal to said original polarization,

- performing the steps of claim 1 a second time with said changed polarization.

4. The method of claim 1, further comprising the steps of:

- splitting the first light beam into a first part and a second part,
- delaying the second part of the first light beam relative to the first part of the first light beam,
- recombining the first and the second part of the first light beam,
- coupling the recombined parts of the first light beam with different polarizations into the optical device under test.

5. The method of claim 1, further comprising the steps of:

- whereby the polarizations of at least one of the following being at least approximately orthogonal to each other: the first and second parts of the first light beam, the first and second parts of the second light beam.

6. The method of claim 1, further comprising the step of:

- whereby each recombined part of at least one of the following has at least approximately 50% of the power of the incoming light beam: each recombined part of the first light beam, each recombined part of the second light beam.

7. The method of claim 1, further comprising the steps of:

- filtering a peak in the spectrum of detected powers, preferably by a band pass filter,
- allocating the peak in the spectrum to the respective part,

- deriving optical properties of the optical device under test from the frequency and polarization dependence of the detected powers.

8. The method of claim 1, further comprising the steps of:

- producing interference between the recombined parts of at least one of the following in a resulting superimposed light beam: the first and second parts of the first light beam, the first and second parts of the second light beam,

- continuously detecting the power of the resulting superimposed light beam as a function of frequency when tuning the frequency of the incoming light beam over a given frequency range,

- detecting a nonlinearity in a tuning gradient frequency when tuning the frequency of the incoming light beam over the given frequency range,

- when detecting a nonlinearity, using said detected nonlinearity information to compensate effects on the detected powers.

9. The method of claim 8, further comprising the step of:

- producing interference by polarizing the recombined parts.

10. The method of claim 1, further comprising at least one of the following steps:

- deriving the polarization mode dispersion of the device under test from the information obtained through the measurement, preferably represented as Jones matrix elements of the device under test,

- deriving the chromatic dispersion of the device under test from the Jones matrix elements of the device under test,

- deriving the principal states of polarization of the device under test from the Jones matrix elements of the device under test,

- deriving the polarization dependent loss of the device under test from the Jones matrix elements of the device under test.

- deriving the fast and slow group delays, associated with the fast and slow principal states of polarization of the device under test from the Jones matrix elements of the device under test.
- deriving the insertion loss of the device under test from the Jones matrix elements of the device under test.
- deriving the transmissivity of reflectivity of the device under test from the Jones matrix elements of the device under test.
- deriving higher-order polarization mode dispersion parameters, such as the rate of change of the differential group delay with frequency, from the Jones matrix elements of the device under test.

11. The method of claim 1 or any one of above claims, further comprising the step of:

    - splitting at least one of the following into a first and a second part in a polarization dependent manner: the first light beam, the second light beam.

12. The method of claim 1, further comprising the step of:

    - separating the spectral components of each of the recombined parts by using two band pass filters, preferably FIR filters, to produce a signal to be processed by a Jones matrix eigenanalysis,
    - shifting either the faster or the slower oscillating signal of the spectral components in frequency so that it is aligned to the other oscillating signal, preferably by using the differential group delay $DGD_{PDU} = \tau_{LO,H}-\tau_{LO,V}$ of the PDU, $\tau_{LO,H}$ being the DGD of one spectral component, $\tau_{LO,V}$ being the DGD of the other spectral component, preferably performing the shift in frequency by subtracting a linear phase term from the analytical signal by multiplying with $\exp(\pm(\tau_{LO,H}-\tau_{LO,V})\omega)$, ω being the frequency of the incoming light beam.

13. The method of claim 1, further comprising the step of:

- choosing a DGD value when delaying the second part of the second light beam relative to the first part of the second light beam relative to a DGD value or vice versa when delaying the second part of the first light beam relative to the first part of the first light beam in a way ensuring that respective spectral components of each part do not intersect.

14. An apparatus for determination of optical properties of an optical device under test, comprising:

a first beam splitter in a path of an incoming light beam for splitting the incoming light beam into a first light beam traveling a first path and a second light beam traveling a second path, wherein

the optical device under test can be coupled in said first path for coupling in the first light beam,

a LO polarization delay unit for:

- splitting the second light beam into a first part and a second part,
- delaying the second part of the second light beam relative to the first part of the second light beam,

recombining the first and the second part of the second light beam,

a second beam splitter in said first and in said second path for superimposing the first light beam and the recombined parts of the second light beam to produce interferences between the first light beam and the recombined parts of the second light beam in at least one resulting superimposed light beam traveling a resulting path,

a detector unit in said resulting path for detecting the power of the resulting superimposed light beam traveling the resulting path as a function of frequency and polarization when tuning the frequency of the incoming light beam over a given frequency range,

an evaluation unit for deriving optical properties of the optical device under test from the frequency dependency of the detected powers.

15. The apparatus of claim 14,

comprising an evaluation unit for deriving elements of the Jones matrix of the optical device under test from the frequency dependence of the detected powers.

16. The apparatus of claims 14 or 15,

further comprising a polarization setting tool positioned in said first path for adjusting the polarization of the first light beam to a defined polarization,

wherein the polarization setting tool is positioned in the path of the incoming light beam before or after the first beam splitter.

17. The apparatus of claim 16,

wherein the polarization setting tool is adjusting the polarization of the respective beam in a linear manner.

18. The apparatus of claim 14,

further comprising: a DUT polarization delay unit for:

- splitting the first light beam into a first part and a second part,
- delaying the second part relative to the first part,
- recombining the first and the second part,
- providing the recombined parts with different polarizations for coupling into the optical device under test.

19. The apparatus of claim 14,

at least one of the following comprises a first polarization beam splitter for splitting the first light beam into a first part and a second part: the LO the polarization delay unit, the DUT polarization delay unit.

20. The apparatus of claim 14,

at least one of the following comprises a second polarization beam splitter for recombining the first part and the second part: the LO polarization delay unit, the DUT polarization delay unit.

21. The apparatus of claim 14,

at least one of the following comprises a first optical path for the first part and a second optical path for the second part, the second path having a longer optical length than the first path, for delaying the second part relative to the first part: the LO polarization delay unit, the DUT polarization delay unit.

22. The apparatus of claim 14,

at least one of the following comprises a polarizing device for providing each of the recombined parts with different polarizations: the LO polarization delay unit, the DUT polarization delay unit.

23. The apparatus of claim 14,

at least one of the following comprises a device for providing the recombined parts with different polarizations to a polarizer to produce interference between the parts in a resulting superimposed light beam traveling a resulting path: the LO polarization delay unit, the DUT polarization delay unit,

the apparatus further comprising a power detector in said resulting path for detecting the power of the resulting superimposed light beam as a function of frequency when tuning the frequency of the incoming light beam over a given frequency range,

whereby an output of the power detector is connected with the evaluation unit for detecting any nonlinearity in a tuning gradient frequency when tuning the frequency of the incoming light beam over the given frequency range, and in case evaluation unit is detecting any nonlinearity, the evaluation unit is using said detected nonlinearity information to compensate effects on the detected powers caused by said nonlinearity.

24. The apparatus of claim 23,

the device being at least one of the following:

an output port of the second polarization beam splitter not to be connected with the optical device under test,

a polarization maintaining coupler to be connected with the output port of the second polarization beam splitter to be connected with the optical device under test,

at least one beam splitter to be connected with the output port of the second polarization beam splitter to be connected with the optical device under test.